

## Introduction

- NASA SPoRT has incorporated Suomi-NPP products into its research and transition activities to improve regional land surface models (LSMs) and numerical weather prediction (NWP)
- Daily global VIIRS green vegetation fraction (GVF) are used to improve the representation of vegetation in the Noah LSM over existing climatological GVF to better simulate:
  - Land-atmosphere energy exchanges during anomalous weather/climate regimes
  - Temperature, moisture, and precipitation features, esp. during warm season

## Background on GVF for Regional Modeling

- NESDIS VIIRS daily global GVF product (Vargas et al. 2013; annual AMS meeting)
  - 4-km resolution based on the VIIRS Enhanced Vegetation Index
  - Over three years of daily data available from NOAA/NESDIS [1 Sep 2012 to present]
  - Conversion routines developed to ingest VIIRS GVF into Land Information System (LIS) and Weather Research and Forecasting (WRF) modeling systems
- SPoRT MODIS-based real-time GVF for land surface modeling and regional NWP
  - Continental U.S. (CONUS) domain at 0.01-deg resolution since 1 June 2010, updated daily with NDVI Direct Broadcast swaths from University of Wisconsin
  - Case et al. (2014; *IEEE TGRS*) documented model sensitivity and impacts
- Both NESDIS/VIIRS and SPoRT/MODIS GVF publicly available for use in WRF model**
- Analysis compares the daily VIIRS GVF to the existing monthly MODIS/FPAR GVF climatology available to the WRF modeling community (NCAR/Barlage MODIS dataset; derived from 2001-2010 MODIS data)

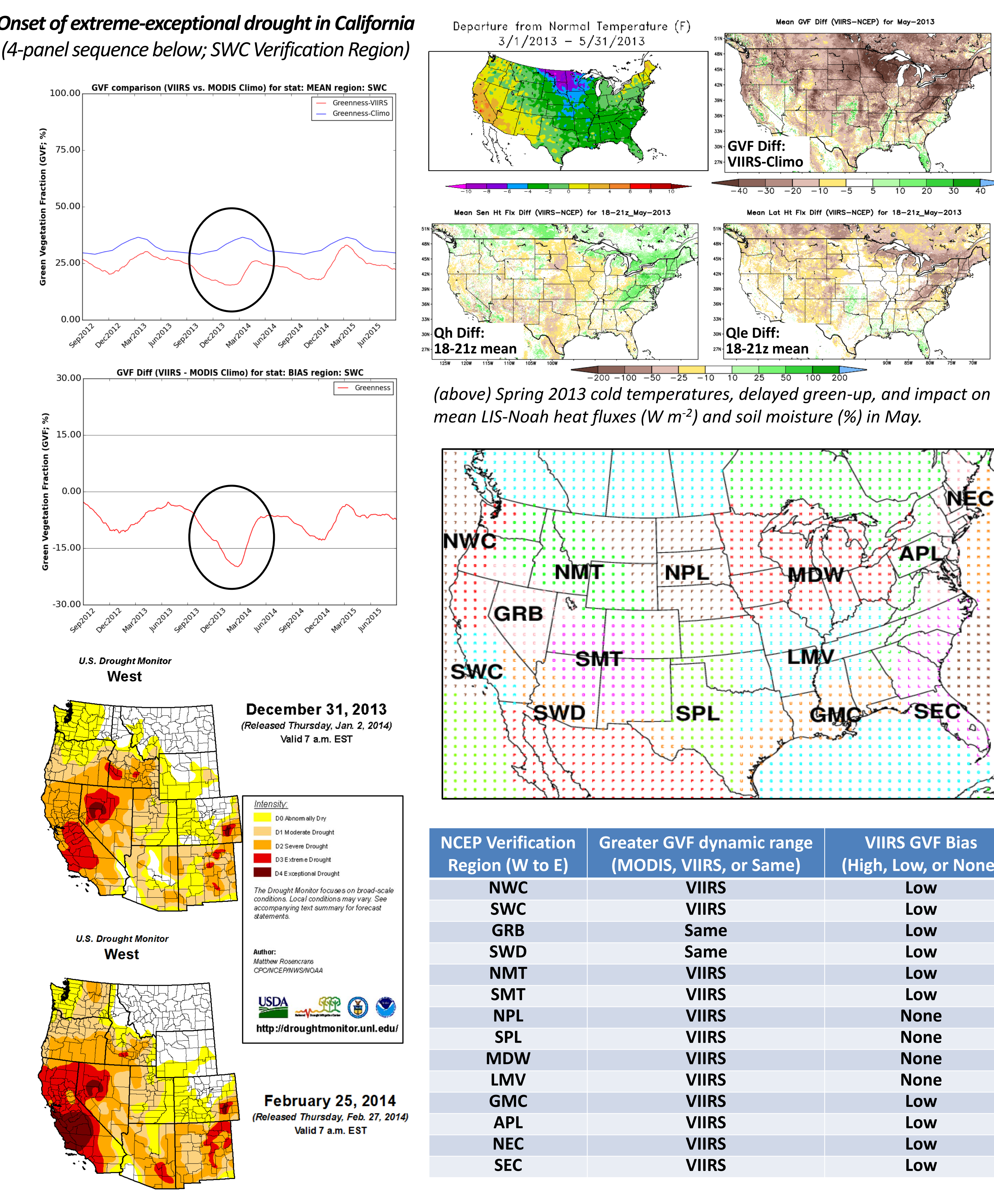
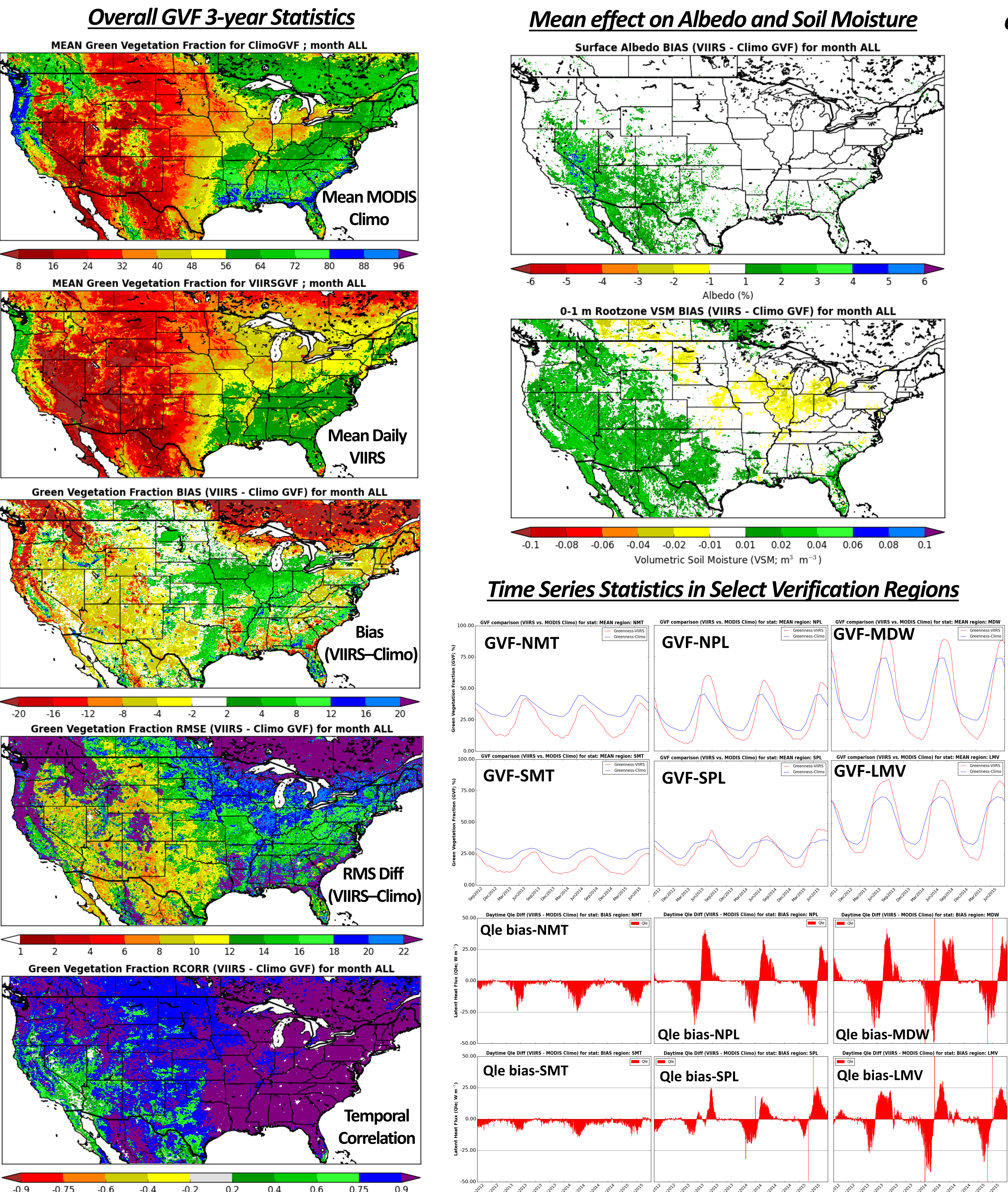
## Methodology and Tools

- Three-year offline simulations of Noah LSM in LIS framework
  - Extension of long-term soil moisture climatology run (1981-2012)
  - Ran with monthly MODIS GVF climatology (control run)
  - Replaced GVF climatology with daily global 4-km NESDIS/VIIRS GVF
  - Analyzed sensitivity with Land surface Verification Toolkit (LVT)
- WRF model simulations during May 2013
  - Picked this month to examine possible impacts due to late green-up, esp. in Midwest
  - Daily WRF model 48-h simulations driven by NAM model initial and boundary conditions
  - Control: MODIS GVF climatology
  - Experimental: daily NESDIS/VIIRS GVF product

## Summary and Future Plans

- Daily NESDIS/VIIRS GVF incorporated into real-time LIS run at SPoRT
  - Offline Noah LSM on full CONUS domain at 0.03-deg resolution
  - SPoRT-LIS output and VIIRS GVF disseminated to select NWS partners for enhanced situational awareness within AWIPS II
- Summary of VIIRS vs. MODIS GVF Climatology over Continental U.S.
  - VIIRS has greater annual dynamic range, but overall lower bias
  - VIIRS depicts GVF anomalies related to drought and abnormal temperatures
  - Corresponding differences occur in mean heat fluxes and soil moisture due to evapotranspiration changes
  - WRF model responds with higher (lower) daytime 2-m T (Td) in clear skies; higher CAPE in Southern Plains where VIIRS GVF is higher over wheat fields
- Future Plans
  - VIIRS GVF-enhanced LIS for international applications in Central America, Caribbean, eastern Africa, and/or south-central Asia

## GVF and LIS/Noah LSM Analysis with Land surface Verification Toolkit (2012-2015)



## WRF Model Sensitivity: May 2013 Anomalous GVF

